

CIRCUIT APPARATUS WITH EXTENDING GENERAL PRUPOSE INPUT OUTPUT PIN

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BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to a controlled circuit, and more particularly to a
circuit apparatus with General Purpose Input Output pin.

2. Description of the Related Art

[0002] As the pace of progress in technology, the peripherals of computer
systems tend to become multiple. In these years, multi media facility, which is for
capturing sound and vision, is the most popular one in computer peripherals.
Therefore, every manufacturer would cudgel brains to devise the most attractive
products for consumers in order to contend for possession of the market in such a
competing market of multi media facilities. Let's take a scanner as an example.
Since being effective is what modern people concern, an easily operated, handy and
convenient scanner must be more welcome by consumers than one with complex
operating schedules. There would be high market value to devise an easy-operated
scanner with multi functions.

[0003] A highly competitive scanner must include a control processing unit with powerful functions to deal with complicated operating tasks. Nowadays, an Application Specific Integrated Circuit, ASIC, is used as a control processing unit to meet designs' requirements. On the practical applications, ASIC enables a scanner to proceed with a vision scan, a vision processing, enlargement, miniature, data input, data output and so on. That is why there are many pins and complex controls in ASIC. Among those pins, researchers can use General Purpose Input Output Pin, GPIO, as an entry of data delivery. For example, when a user presses a functional button of a scanner, the scanner can feed the input signal into ASIC through the pins of GPIO for further processing then the scanner can perform a reaction to the input signal. Likewise, for outputting data, a scanner can also use ASIC to output data through the pins of GPIO for further data processing.

[0004] Due to highly competition in the modern scanner market, every manufacturer would have to provide a scanner not only with basic scanning functions but also with additional multiple functions, which can play as competitive distinction and increase the possession ratio of the market. For example, in order to increase additional value of a scanner, a modern scanner can also provide multiple functions such as photo copy, fax, transmitting electric vision and so on. There is one thing needed to be aware of. Although the additional functions of a scanner bring users a lot of convenience, in the hardware design of the scanner, it also need more GPIO pins in ASIC in order to meet the requirements of multiple functions. For instance, a scanner originally uses an ASIC with 100 pins. There are only 6 pins left for GPIO pins after deduction pins for necessary functions. Due to the increase of function

buttons, a scanner needs more GPIO pins (like 10 pins). Therefore, a manufacturer has to use an ASIC with 104 pins. But, as the limitation of package techniques, the number of ASIC pins can not increase as many as needed. For example, the number can only be increased in 100, 125, and so on. Therefore, a manufacturer has to adopt an ASIC with 125 pins as the ASIC of a scanner. It would not only waste those not used pins, but also increase the cost of the product, and decrease the product usage of that product.

SUMMARY OF THE INVENTION

[0005] It is therefore an object of the invention to provide a circuit apparatus with extending General Purpose Input Output pins to extend original functions of GPIO pins and reduce production cost.

[0006] The invention achieves the above-identified objects by providing a circuit apparatus with extending General Purpose Input Output pins, which includes a control processing unit, a memory and a buffer. Wherein, data pins of a control processing unit are coupled to pins of a memory and a buffer. If a buffer is used as a buffer for inputting signals, input signals can be temporarily stored in the buffer. While a memory receives a recharging signal for refreshment, a control signal enables a buffer to feed input signals into a control processing unit during the interval of recharge of the memory. Likewise, if a buffer is used as a buffer for outputting

signals, output signals from a control processing unit can be fed into a buffer and send out while a memory is being refreshed. Therefore, the pins of a control processing unit and a memory can achieve the function of GPIO. That is why this kind of circuit of apparatus can be called a circuit apparatus with extending General Purpose Input Output pins.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Objects, features, and advantages of the invention will become apparent from the following detailed description of the preferred but non-limiting embodiments. The description is made with reference to the accompanying drawings, in which:

[0008] Figure 1 is an illustration that shows the circuit apparatus with extending General Purpose Input Output pins according to the preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] Please refer to FIG. 1 It illustrates the circuit apparatus with extending General Purpose Input Output pins according to the preferred embodiment of the

invention. In this figure, a control processing unit 110 like an Application Specific Integrated Circuit (ASIC), is coupled to a memory 120. As it is shown in the figure, there are data pins P1, P2, P3, P4, P5, P6, P7, and P8 in a control processing unit. Those pins also individually connect with the memory pins, MP1, MP2, MP3, MP4, MP5, MP6, MP7, and MP8 in the memory 120. In addition, one thing, which should be aware of, is that a memory 120 in the figure has a character for refreshment, such as a Dynamic Random Access Memory (DRAM). Therefore, in order to maintain stored data in Memory 120 without loss, a recharging signal (RC) would cyclically recharge the memory 120.

[0010] Generally speaking, the bus between the control processing unit 110 and the memory 120 is for data delivery between the memory 120 and the control processing unit 110. However, there is no data transmitted between the memory 120 and the control processing unit 110 when recharging signal, RC refreshes the memory 120. It means the bus is free at that time. The invention uses such a spare time when the memory 120 is recharging, to feed input signals into the data pins of a control processing unit through the bus, or transfer output signal from a control and processing one through the bus. Therefore, this kind of circuit apparatus can be called a circuit apparatus with extending GPIO pins. The detail description of its embodiment is made as following.

[0011] In practical application, pins of the buffer 130, which are BP1, BP2, BP3, and BP4, can be coupled to the pins of the control processing unit 110, which are P1, P2, P3, and P4, and to receive control signal, CS, from the control processing unit,

as it is shown in the figure. One thing that needs to be aware of is a control signal (CS) is designed to be synchronized with the recharging signal (RC). Therefore, when the memory 120 is being recharged, the control signal CS would enable a buffer 130 and let the buffer 130 in an active situation. While the buffer 130 is in an active situation, the control processing unit 110 can also detect changes of situation in pins of the buffer 130. If there is any temporarily stored input signal (Si) in a buffer previously, when the buffer 130 is enabled, the input signal Si can be fed into the control processing unit 110. The control processing unit 110 can then further process data according to the input signal Si. That is, the buffer 130 is used as an input signal buffer at this moment. And, the control processing unit 110 can receive signals from data pins, P1, P2, P3, and P4, as input signals and process them.

[0012] Let's take the buffer 130 as an example of an input signal buffer.

When a user presses a start button of scanning, the buffer 130 would latch the input signal (Si) first, and wait until the memory 120 receives a recharging signal RC and starts to be recharged. While the memory 120 is being recharged, the control processing unit 110 will feed a control signal (CS) into the buffer 130 to enable it and transfer input signals Si into the data pin (P1) of the control processing unit. Then, a control processing unit can further process on input signal Si. Briefly, the data pin P1 is applied as a pin to receive input signals Si for the control processing unit 110 while the memory 120 is being recharged. Since the time span of pressing a button (such as about 100-400 ms) is general much longer than the span of a refreshing cycle of a memory (like about 7 ms), an input signal Si can definitely be detected by the control processing unit. Beside, the buffer 130 must be a buffer which action situation can be

controlled by external signals such as a control signal CS. For example the buffer model 74HC/HCT244 is a right one.

[0013] On the other hand, pins (BP5, BP6, BP7, and BP8) of a buffer 140 can individually connect with data pins of the control processing unit 110 electrically, and also receive a control signal (CS) from a control processing unit, as it is shown in the figure. While a memory 120 is being recharged, a control signal (CS) can enable the buffer 140 and let the buffer 140 in an active situation. While a buffer is in an active situation, the control processing unit 110 can feed an output signal (So) from a data pin P5 into the buffer 140, and transfer the output signal (So) through the buffer 140. That is, the buffer 140 is used as an output signal buffer, such as Model TC74/HCT374 buffer, and data pins of a control processing unit (P5, P6, P7, and P8) are applied as the outlets of signals.

[0014] In short, because that not only this kind of circuit apparatus can use the existent bus to process data delivery while a memory is being refreshed, it means that data pins of the control processing unit 110 can not only access data of the memory 120, but also this kind of circuit apparatus can be used as pins of GPIO while a memory is being recharged, therefore, this circuit apparatus can be named as a circuit apparatus with extending GPIO pins. One thing, which needs to be noticed, is that control signals CS of the buffer 130 and 140 are not necessarily limited to be sent from the control processing unit 110. The control signals can be sent from other units to achieve the same function.

[0015] The above embodiment reveals that the invention, a circuit apparatus with extending General Purpose Input Output pins, can flexibly increase General Purpose Input Output pins of an Integrated Circuit. Thus, the production cost will be less and the product usage will be improved.

5 [0016] While the invention has been described by way of example and in terms of a preferred embodiment, it is to be understood that the invention is not limited thereto. On the contrary, it is intended to cover various modifications and similar arrangements and procedures, and the scope of the appended claims therefore should be accorded the broadest interpretation so as to encompass all such modifications and
10 similar arrangements and procedures.